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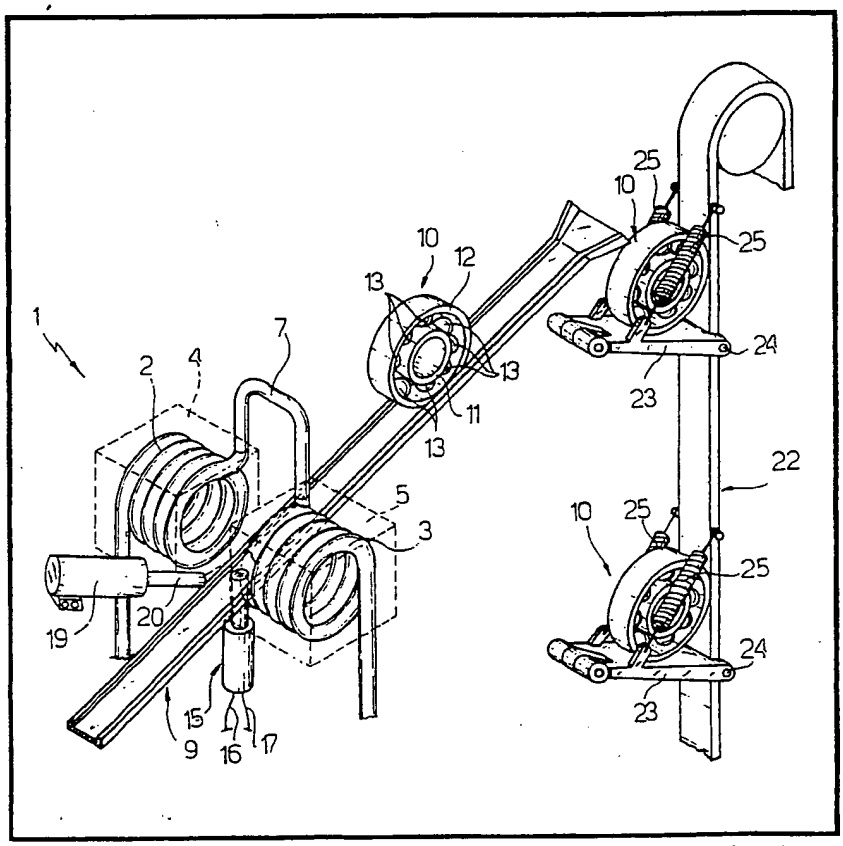
(54) Demagnetizing devices

(57) A capacitor discharge demagnetizing device (1) comprises a first inductor (2) and a second inductor (3) disposed along the same axis, and a guide (9) by means of which a work piece (10) to be demagnetized is introduced between the two inductors (2, 3). A proximity sensor (15) causes a capacitor to discharge through the inductors (2, 3) when the work piece (10) lies between them. A pneumatic piston (19) may position a bar (20) to retain the work piece (10) between the inductors (2, 3) for additional demagnetisation cycles. The inductors (2, 3) may be connected in series (as shown) or in parallel and may be provided with magnetic cores.



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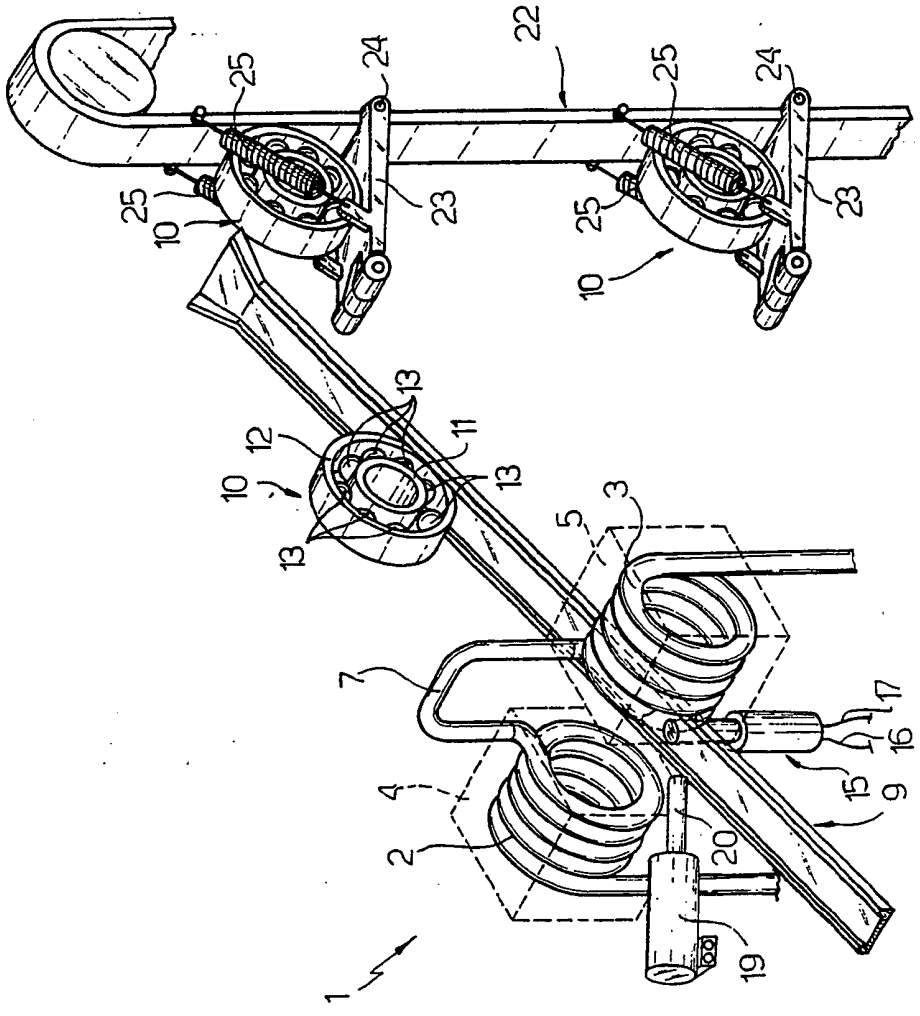

SPECIFICATION

Improvement to a demagnetizing device

The present invention relates to an improvement to a demagnetizing device.

In particular, the present invention relates to a demagnetizing device of the type with capacitor discharge, i.e. of the type comprising a capacitor apt to be discharged onto an inductor so as to generate damped free oscillations of the current which flows in the said inductor. The piece to be demagnetized is disposed in such a manner as to be acted upon by the magnetic field generated by the inductor, in order to be demagnetized.

Although these demagnetizing devices have considerable advantages, from the conceptual point of view, with respect to the prior art devices comprising only an inductor, from the structural point of view they still have some disadvantages.

In particular, when the piece to be demagnetized is composed of a plurality of parts which may screen reciprocally, as for example in a mounted bearing, it is important the direction of the demagnetization field to be such as to minimize the effects of the screening; in particular, in the case of a bearing, the said direction should be coaxial with the direction of the magnetic field present in the bearing, so as to prevent the outer race of the bearing from paritally screening the inner race or the balls.

In the known demagnetizing devices, the inductor generally is a solenoid type inductor, and in order to comply with the specific requirement of the direction of the magnetic field it is necessary to introduce the bearing into the inductor, with its axis made to coincide with the axis of the inductor. Therefore it is necessary to use a suitable transport device in order to correctly demagnetize each bearing.

In the case in which the dimensions of the pieces to be demagnetized are comprised within a wide range, it is necessary to provide for each group of pieces to be demagnetized having approximately the same dimensions, a suitable inductor within which the piece has to slide and whose dimensions have to match with those of the piece. Accordingly, the known demagnetizing devices require considerable equipment expenses.

The object of the present invention is to provide a demagnetizing device of the type with discharge of the capacitor, which device will allow to eliminate the above mentioned structural disadvantages of the known devices.

According to the present invention a capacitor discharge type demagnetizing device is provided, characterized in comprising a first and a second inductors disposed along the same axis, and a guide by means of which a body to be demagnetized is introduced in a pre-established position between the said first and second inductor.

For a better understanding of the present invention, a preferred embodiment will now be described in detail, by way of a non limiting example, with reference to the accompanying drawing showing diagrammatically and in persective a demagnetizing device constructed in accordance with the teachings of the present invention.

In the said drawing, reference numeral 1 indicates generally a portion of a demagnetizing device of the capacitor discharge type, of which device only a couple of solenoid type inductors 2 and 3 are shown.

In particular, inductors 2 and 3 are disposed along the same axis in the interior of respective support bodies 4, 5 provided with means (not shown) which allow to adjust in an axial direction their reciprocal distance. From the electric point of view the inductors 2 and 3 have terminals facing one another and connected to one another by means of a conductive wire 7 forming a loop, and opposite terminals which are connected, in a manner not shown, to a capacitor through switch means (not shown).

Disposed in the space comprised between the inductors 2 and 3 is a guide 9, inclined relative to the horizontal plane, onto which a piece to be demagnetized may be made to advance. In the present example, the said piece to be demagnetized is a ball bearing 10 substantially comprising an inner race 11 and an outer race 12 having lodged therebetween a plurality of balls 13. Bearing 10 is apt to roll along guide 9, which is formed by a C-shaped element, made of a material not sensitive to magnetic fields, in order to correctly guide in its interior the said bearing 10.

Mounted in the space comprised between the inductors 2 and 3 and beneath the guide 9 is a proximity sensor device 15 which is apt to emit an electric signal to respective connection cables 16, 17 when a bearing 10 passes on guide 9 in the space comprised between the inductors 2 and 3. Finally, mounted downstream of the said inductors 2 and 3 is a stop device 19, for example a pneumatic piston, which, in response to the reception of a control signal, positions a bar 20 along the path of movement of the bearing 10 within the guide 9 so as to temporarily lock the bearing between the couple of inductors 2 and 3.

Finally, each bearing 10 is fed onto the top of the guide 9 by means of a vertical conveyor belt provided with a plurality of supporting planes 23 having a first end rotatable about a support pin 24 carried by the belt 22 and a second end connected to the belt 22 by means of springs 25.

The operation of the demagnetizing device 1 is as follows

Each bearing 10 is fed at a pre-established recurrence frequency, depending on the speed of the belt 22 and on the distance between two consecutive planes 23, to the top of the guide 9, rolls along the guide 9 and enters the space between the inductors 2 and 3 where it enables the sensor device 15. This latter, through a processor circuit not shown, acts onto the switch means mentioned above, so as to connect inductors 2 and 3 to the capacitor, which has been charged previously. Therefore, the magnetic field generated by said switch means assumes alternately positive and negative values whose amplitude dampens exponentially, thus generating a cycle of damped free oscillations having a duration of some tens of ms. If the initial amplitude of the magnetic field is sufficient to give rise to the saturation of the material forming the bearing 10, this latter is demagnetized during the passage between the inductors 2 and 3, whose demagnetizing action is correct because the field generated by them is able to traverse in an axial direction the races 11 and 12 and the balls 13.

In case the dimensions of the ball bearing 10 are such as to require more than one cycle of oscillations of the demagnetizing field, the stop device 19 is actuated, which, by means of the bar 20, maintains the bearing 10 between the inductors 2 or 3 for the time required for the capacitor to recharge so that the required number of demagnetizing cycles may be generated.

From the analysis of the characteristics of the present invention it can be noted that the demagnetizing device 1 allows to achieve the above-mentioned objects of the present invention.

In fact, the lines of force of the magnetic field in the zone comprised between the inductors 2 and 3 assume an axial direction with respect to the bearing 10 which in this way results in being in the best conditions for being correctly demagnetized.

Since the distance between the inductors 2 and 3 is adjustable, it is possible to adjust every time this distance in accordance with the dimensions of the piece to be demagnetized, so that a single demagnetizing device of the type described hereinabove may be used for pieces having even very different dimensions from each other.

For example, guide 9 may be configured every time in such a way as to better match with the structure of the piece to be demagnetized, and eventually it could also be replaced by a conveyor belt. Moreover, inductors 2 and 3, which in the drawing are shown as connected in series, could also be connected in parallel, provided the respective magnetic forces result in being in phase, and could also be wound on a magnetic core made, for example, of ferrite.

CLAIMS

1. A demagnetizing device of the type with capacitor discharge, characterized in comprising a first and a second inductor, disposed along the same axis, and a guide by means of which a piece to be demagnetized is introduced in a pre-established position between the said first and second inductors.

2. A demagnetizing device as claimed in Claim 1, characterized in comprising a detector device apt to detect the presence of the said piece and disposed in the said pre-established position, the said detector device enabling the generation of an oscillating magnetic field damped by the said inductor.

3. A demagnetizing device as claimed in Claims 1 or 2, characterized in that the said guide is configured as an inclined plane and that the said piece is fed onto the top of the said guide.

4. A demagnetizing device as claimed in any of the preceding Claims, characterized in comprising mechanical stopp means for stopping the piece, which are apt to maintain the said piece in the said pre-established position for period of time of pre-established duration.

5. A demagnetizing device as claimed in Claim 4, characterized in that the said period of time has a duration sufficient to allow the said inductor to emit at least a pair of cycles of oscillation of the said magnetic field.

6. A demagnetizing device as claimed in Claims 4 and 5, characterized in that the said mechanical stop means comprise a pneumatic piston.

7. A demagnetizing device as claimed in any of the preceding Claims, characterized in comprising means for adjusting the relative position between the said first and second inductors.

8. A demagnetizing device as claimed in any of the preceding Claims, characterized in that the said inductors are wound on a magnetic core.

9. A demagnetizing device as claimed in Claim 8, characterized in that the said magnetic core is made of ferrite.

10. A demagnetizing device of the type with capacitor discharge, substantially as described hereinabove with reference to the accompanying drawing.

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